IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
James J. GENOVA, et al.	)	Examiner: Lam P. PHAM
	)	
Application No.: 10/735,718	)	Group Art Unit: 2636
	)	
Filed: December 16, 2003	)	Confirmation No.: 3456
	)	
For: SELF-PROTECTED FIRE-SENSING ALARM APPARATUS AND METHOD	)	

DECLARATION OF JAMES J. GENOVA, LAURA SIMKINS AND STEPHEN C. KENYON UNDER 37 CFR § 1.131

MAIL STOP NO FEE AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

We, James J. Genova, Laura Simkins and Stephen C. Kenyon, having respective post office addresses at 14601 Colony Creek Court, Woodbridge, Virginia 22193, 12504 Piedmont Road, Clarksburg, Maryland 20871, and 12404 Bunche Road, Fairfax, Virginia 22030, hereby declare and say as follows:

1. We are the original and only co-inventors of the subject matter disclosed and claimed in the above-identified U.S. patent application. We have reviewed the subject application, the August 9, 2005 Official Action, the currently-pending claims and the Response being submitted concurrently herewith, in preparing this declaration.

2. We conceived the subject matter of at least the inventions recited in claims 1-67,

and, in particular, independent claims 1, 19, 35 and 53 prior to the October 16, 2003, filing date of U.S. Application No. 2005/0083205 to Deacy. Furthermore, we acted to diligently reduce to practice the subject matter of at least the inventions recited in claims 1-67, and, in particular, independent claims 1, 19, 35 and 53 from the conception thereof up to at least October 16, 2003. Moreover, from a date prior to October 16, 2003, through October 16, 2003 to the filing date of the above-identified application, we diligently continued to work to reduce to practice the subject matter of at least the inventions recited in claims 1-67 and, in particular, independent claims 1, 19, 35 and 53. We aver that a constructive reduction to practice of that subject matter occurred at least as of the filing date of the above-identified patent application on December 16, 2003.

3. Enclosed as Exhibit A is a copy of disclosure materials describing the conceived inventions recited in claims 1-67 and, in particular, independent claims 1, 19, 35 and 53. These materials were prepared in mid-April of 2003, and establish that the invention was conceived prior to October 16, 2003. These materials also provide evidence that the invention was being diligently reduced to practice from the conception thereof up to at least October 16, 2003.

4. For example, Exhibit A describes a fire-sensing apparatus, as recited in independent claim 1, including the features of:

a flame sensor for detecting a presence of flame within a volume;

a tamper sensor for detecting tampering to the apparatus, wherein the tampering prevents the apparatus from detecting the presence of flame within the volume; and

an alarm indicator for indicating an alarm condition in response to at least one of i.) a detection of the presence of flame within the volume, and ii.) a detection of tampering to the apparatus.

5. Furthermore, Exhibit A also describes a fire-sensing system, as recited in independent claim 19, including the features of:

a fire sensor for detecting a presence of at least one of flame and smoke within a volume;

tamper countering structure for countering attempts to prevent the fire sensor from detecting the presence of the at least one of flame and smoke within the volume; and

a transmitter for transmitting an alarm notification upon detection of at least one of i.) the presence of at least one of flame and smoke within the volume, and ii.) an attempt to prevent the fire sensor from detecting the presence of the at least one of flame and smoke within the volume.

6. For example, Exhibit A further describes a method for sensing fire within a volume, as recited in independent claim 35, including the steps of:

detecting a presence of flame within the volume;

detecting tampering that prevents a detection of the presence of flame within the volume; and

indicating an alarm condition in response to at least one of i.) the detection of the presence of flame within the volume, and ii.) the detection of tampering that prevents the detection of the presence of the flame within the volume.

7. Additionally, Exhibit A describes a method for sensing fire within a volume, as recited in independent claim 53, including the steps of:

detecting a presence of at least one of flame and smoke within the volume;

countering attempts to prevent a detection of the presence of the at least one of flame and smoke within the volume; and

transmitting an alarm notification upon detection of at least one of i.) the presence of the at least one of flame and smoke within the volume, and ii.) an attempt to prevent the detection of the presence of the at least one of flame and smoke within the volume.

8. Therefore, it is evident that the present application claims inventions that were conceived of and being diligently reduced to practice prior to October 16, 2003.

9. We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or of any patent issuing thereon.

James J. Genova — 2/1/2006

James J. GENOVA — Date

Laura SIMKINS — Date

Stephen C. KENYON — Date

9. We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or of any patent issuing thereon.

James J. GENOVA	Date
Laura Simkins	January 30, 2006
Laura SIMKINS	Date
Stephen C. Kenyon	30 Jan 2006
Stephen C. KENYON	Date

Customer No.: 27160

Title: Self-Protected Flame Sensing Alarm System

Inventors: James J. Genova, Woodbridge, VA
Stephen Kenyon, Fairfax, VA
Laura Simkins, Clarksburg, MD

Assignee: TBD

References Cited [Referenced By]

U.S. Patents

Number	Date	Name	Ref.
6,346,712	Feb 2002	Popovic, et al	250/554
6,320,501	Nov 2001	Tice, et al	340/517
6,300,876	Oct 2001	Sakurai, et al	340/630
6,281,791	Aug 2001	Murao	340/524
6,281,790	Aug. 2001	Kimmel, et al	340/506
6,263,050	July 2001	Akhteruzzaman, et al	379/45
6,259,444	July 2001	Payne	376/45
6,259,363	July 2001	Payne	340/506
6,239,697	May 2001	Murao	340/506
6,239,433	May 2001	Porter	250/338
6,195,014	Feb 2001	Sakurai, et al	340/630
6,195,003	Feb. 2001	Ichikawa, et al	340/506
6,140,145	Oct, 2000	Chandra, et al	438/57
6,064,064	May 2000	Castleman	250/339
5,920,071	Jul 1999	Weirauch	250/370
5,861,626	Jan 1999	Chandra, et al	250/338
5,828,068	Oct 1998	Weirauch	250/370
5,339,072	Aug. 1994	Agata	340/693
5,311,167	May 1994	Plimpton, et al	340/578
5,257,013	Oct. 1993	Lewkowicz	340/578

20020011570	Jan 2002	Castleman	250/339
20020000914	Jan 2002	Castleman	250/339

Abstract: The present invention automatically monitors a volume or room for the occurrence of a flame or fire. While the occurrence of a flame or fire in the volume may be unintentional, the volume of interest is the location of a potential flame as might be caused by an individual intentionally causing a flame for the purposes of causing a hazard to property or persons; or with the intent of lighting a cigarette where smoking is not permitted. Thus, it is anticipated that a person or persons may deliberately attempt to counter said system in its efforts to detect the fire. Expected countermeasures may include, but are not limited to, attempts to blind the sensor, attempts to damage the sensor, and attempts to move or remove the sensor. The sensor system has deliberate means to negate any or all of these counter measures. Upon the occurrence of a fire or any such event an alerting signal is sent to a concerned person. This person can be local or remote to the system. This alerting signal can be an audible or visual signal. This signal may be sent via a wire or a wireless communications system.

19 Claims, 9 Drawings

Self-Protected Flame Sensing Alarm System

Field of the Invention: The present invention relates generally to flame or fire detection and more particularly to fire detection within a location where deliberate attempts may occur to prevent said invention from detecting said flame or fire such as may be affected by a person attempting to smoke in an area where smoking is prohibited. The present invention is such a system that counters the several deliberate actions designed to degrade the fire detection performance of said system.

Background: There are many places where smoking or the lighting of matches and lighters is prohibited. This prohibition can result from a decision of the persons responsible for the room or an incentive from an insurance carrier. The prohibition can be the result of a concern for personal health and or the need to protect property. "No Smoking" areas include public rest rooms and other areas of public schools, restaurants, office buildings, aircraft, airports, etc. In addition recent concerns related to the lighting of matches on aircraft relate to attempts to ignite a bomb or fire aboard a commercial aircraft.

In some of these areas or rooms there are smoke detectors and/or flame detectors. These devices generally provide a means to detect smoke or flame and notify those in the area via an alarm. In some instances the notification can be sent to a remote location via a wire or wireless communications device. (Ref. Fire alarms, 6,281,791 or 6,239,697, by Murao or 6,195,003, by Ichikawa, et al.)

Smoke detectors use light scattering or other means to sense the smoke associated with a fire. These devices generally require concentrations of smoke that may be associated with significant fire located in the room. These detectors are useful to save lives and property from fires that are not controlled. (Ref. Smoke det. 6,195,014)

Flame detectors make use of radiation emissions associated with flame. Typical radiations include infrared and ultraviolet. The response time of flame detectors is faster

than that of smoke detectors and the probability of detection is better than smoke detectors since they detect the flame emissions rather than the build up of smoke. In particular environments, multiple wavelengths and statistical fluctuations are used to reduce false alarms. These systems are typically used in areas with explosive materials to reduce hazardous explosions. These systems can be more expensive than smoke detectors or flame detectors using a single wavelength. (Ref. Flame det., e.g. 5,959,589 by Sadovnik, et al and 6,239,433 by Porter)

To be useful the sensor systems must be coupled with an alerting system. Some use audible or visible signals to alert persons in the area of the danger. In some instances security personnel are notified of the hazard. In some instances the alert can be local to the sensor. In some instances the alert is sent via a wired or wireless transmission to a remote location.

As a means of reducing missed detections and improving reliability, alarm systems have been designed with self-testing circuits or low battery indicators.

In situations of particular interest to the present invention, it may be that the person attempting to smoke a cigarette or cause fire damage through the use of the flame may want to willfully and deliberately violate the prohibition. The person, if aware of the presence of a monitoring device in the area, may attempt to deliberately negate the performance of any such detectors placed in the area to monitor for an event related to fire or flame.

Agata addressed some of these issues in August of 1994 by redesigning the case of a smoke detector to prevent persons from placing a cup or plastic bag over the sensor in such a manner as to block smoke from entering the detector. However, attempts to negate a sensor designed to monitor for smoking can be negated in a multitude of additional ways. (Ref. 5,339,072 Agata, 8/94)

Existing devices are generally vulnerable to deliberate attempts to negate the performance of such a detector. Such attempts may generally include covering the sensing element, smashing, removing, or otherwise damaging the detector.

Objects of the Invention: Therefore, it is an object of the invention to provide a means to monitor a particular volume for the purpose of notification to a responsible person at another location of the occurrence of the flame or fire such as may be associated with lighting smoking material or causing a fire.

It is another object of the invention to combine this sensing capability with the means to protect itself from attempts to degrade or counter the sensor's performance.

It is an object of the invention to combine this sensing capability with the means to protect itself from attempts to blind the sensor.

It is an object of the invention to combine this sensing capability with the means to protect itself from attempts to damage the sensor.

It is an object of the invention to combine this sensing capability with the means to protect itself from attempts to move or remove the sensor.

It is another object of the invention to provide a means for notification to a person at another location of the occurrence of events such as may be associated with attempts to negate the performance of the sensor.

Summary of the Invention: In accordance with these objectives, the present invention seeks to provide a means for the automatic monitoring of a volume or room for the occurrence of a flame or fire specifically in such a volume where the occurrence of a flame or fire may be unintentional but while the volume of interest is the location of a potential flame as might be caused by an individual intentionally causing a flame for the purposes of causing a hazard to property or persons, or with the intent of lighting a

cigarette where smoking is not permitted. Thus, a person or persons may deliberately attempt to counter the performance of the system. Expected counter measures may include, but are not limited to, attempts to blind the sensor, attempts to damage the sensor, and attempts to move or remove the sensor. The sensor system seeks to incorporate several deliberate means to negate any or all of these counter measures. Upon the occurrence of an event an alerting signal is sent to a concerned party. This party can be local and or remote to the system. This signal can be an audible or visual signal. This signal may be sent via a wire or a wireless communications system.

Brief Description of the Drawings:

Figure 1 is an illustration of the sensor module as may be mounted in a rest room. The illustration depicts a detection of a flame and the subsequent transmission of an alert to a remote location.

FIGURE 2 is an illustration of the sensor module.

Figure 3 is a cut away view of the sensor module illustrating the several individual sensors.

Figure 4 is an illustration of the several functions and a typical logic flow of the sensor module.

Figure 5 is an illustration of the monitor module.

Figure 6 is a block diagram of the sensor module.

Figure 7 is a functional flowchart of sensor operations.

Figure 8 is a block diagram of the monitor.

Figure 9 is a functional flowchart of the monitor processes.

Detailed Description of the Preferred Embodiment: Figure 1 shows an embodiment of the invention for a flame alert system **1**. The system is described as might be used in a rest room **2** of a public school, but may be envisioned in any number of variations and configurations as, for example, might be utilized in a restaurant, an aircraft seating area or rest room, or any number of other volumes where a fire or flame is prohibited but may be deliberately ignited. The fire **3** causes an effect such as, for example, the emission of ultraviolet radiation **4** that can be detected at the sensor **1**. Upon the ignition of the fire **3** in the volume or any number of actions to attempt to degrade the performance of said sensor, the sensor module detects such action and communicates **5** this information to a monitor module **13** that is typically at a remote location.

Figure 2 shows the sensor module **1**. The module is of rugged construction making it difficult to damage the module through ordinary and expected means such as striking the module with a hard object. In addition the sensor module may be enclosed in an object such as to conceal its intent. Such enclosures may be expected to be present in the room of interest such as a sprinkler head, light fixture, or other common device. The sensor module is securely attached to a wall or ceiling. The sensor module is positioned such as to provide the best field of view to the volume of interest by the internal detectors via a radiation transparent window **6**. If necessary, multiple modules may be placed in the same volume (and given the same identification) to provide improved coverage.

Figure 3 illustrates a typical layout of the multiple components and detectors contained within the sensor module **1**. A typical sensor module may contain an ultraviolet sensor **7** that responds to ultraviolet radiation typical to a flame from a lighter or match, but absent from standard incandescent or fluorescent lighting and absent from sunlight. Ultraviolet radiation reflects from most standard surfaces. Thus, the sensor does not require line of sight to the flame. In such a manner the detector is expected to be very sensitive to flames in a volume where flames are prohibited and not subject to false alarms from standard lighting such as may be expected in said volume or room. Upon the occurrence of the

ultraviolet radiation, the sensor module communicates **11** a signal to alert security personnel as indicated above.

In addition Figure 3 illustrates the presence of a sensor of visible light **8**. It is expected that some level of visible light will be present in the volume of interest during its normal operation. The absence of visible light would then be an indication of deliberate attempts to blind the ultraviolet or flame sensor by covering said sensor with an opaque object or material. Upon the occurrence of the absence of visible light, the sensor module communicates **11** a signal to alert security personnel as indicated above.

In the preferred embodiment a solar cell can be utilized as the visible light detector **8**. In this instance said visible light sensor generates low levels of electrical energy. Such energy can be utilized to extend the life of the module battery power supply **9** in a configuration that does not have access to AC power.

In addition Figure 3 illustrates the presence of a motion detector **10**. It is expected that some level of motion will be present if attempts are made to remove or move the sensor module. The sense of motion would be indicative of deliberate attempts to prohibit the function of the ultraviolet or flame detector **7** by removing said sensor from its mounted position. Upon the occurrence of the motion the sensor module communicates **11** a signal to alert security personnel as indicated above. The information and functioning of the sensor module **1** and its several components is managed via an electrical circuit **12.**

Figure 4 is an illustrative example of several functions of the sensor module. The circuit **12** contained in the sensor **1** monitors for events indicative of a fire or flame such as may be sensed via the ultraviolet sensor **7**. The circuit monitors for deliberate attempts to degrade or negate the performance of its stated purpose such as may be indicated by loss of visible light **8**. The circuit **12** monitors for deliberate attempts to degrade or negate the performance of its stated purpose such as may be indicated by motion **10**. In addition said circuit periodically and to some extent randomly generates messages that are transmitted **5** via the transmitter **11** to the monitor module **13**. The periodic message indicates that the

module is performing as designed. The periodicity is somewhat randomized to prevent message collisions in a situation as may be expected where multiple rooms are being monitored. An alternative message is transmitted indicative of an event requiring attention from a security person. Each message contains an identifier code such as to indicate the location of the source of said message.

For example, if a flame is ignited in the rest room for the purpose of lighting a cigarette a message is sent to the monitor. An audible and visible (and, perhaps, a tactile) alert is caused together with information to identify the location of the event in an instance where the facility has multiple rooms under surveillance. Upon receipt of the information an individual is dispatched to investigate the room.

In the preferred embodiment the messages are sent via a wireless radio **11** although it is expected that a wired system can be used where practical. As envisioned there is no need to send signals from the monitor module to the sensor module. Therefore, the sensor module contains a simple radio transmitter unit **11**. The transmitted messages **5** contain an identification code in the situation where multiple rooms **2** are being monitored. The second part of the message contains a code indicating that the sensors detect no events or that a sensor detects an event. The message may or may not identify the event. Messages are sent periodically and pseudo randomly. The period is varied to minimize message traffic collisions. If a signal is not received within a predefined interval an alert is displayed indicating this fact. The cause of a missing signal may be a low battery, a defective sensor module, or, more probably, a deliberate attempt to damage the sensor module.

Figure 5 is an illustrative example of a monitor module **13**. The purpose of the monitor module **13** is to provide a remote display **14** and **15** of the condition at the single or multiple rooms being monitored. Upon receipt of a periodic signal indicative of sensor module wellness, no alert is indicated. Upon the receipt of a signal indicative of an event an audible, tactile, and or visible alarm is caused thereby alerting security personnel of said event. In addition the location of said event is indicated via a predefined

identification code. The absence of the receipt of a scheduled periodic signal is indicative of a deliberate damage to said module or a low power (i.e. battery) condition at said module. In either case an alarming signal is caused thereby alerting security personnel of said event. It is expected that the monitor module **13** may be a portable unit and or a fixed unit such as may be placed in a room generally in communication with security personnel. The portable unit embodiment is expected to have a low battery indicator **16.** The fixed unit embodiment would be expected to have a corresponding power indicator.

Figure 6 illustrates the electronic configuration of the sensor module. Ultraviolet sensor **17** is sensitive in the near-ultraviolet part of the spectrum and may be a solid state device or a gas ionization device. The sensor provides an electrical signal to preamplifier **20** to perform necessary signal conditioning prior to analog to digital conversion by **25**. A motion sensor **18** may be included as one of the methods for detecting tampering or other motion. The motion signal is amplified by preamplifier **21** prior to analog to digital conversion by **25.**

Photocell **19** serves two purposes. The first is the detection of visible light as a method of identifying tampering by blocking the light input to the sensor. The photocell **19** output is amplified by preamplifier **22** and then digitized by analog to digital converter **25**. This signal represents the intensity of visible light in the vicinity. Ultraviolet sensor **17** and photocell **19** will be configured such that an attempt to block the ultraviolet sensor will also block the photocell, indicating that tampering is likely. Photocell **19** also supplies current to battery charger **23** for the purpose of recharging battery **26**. Photocells may be selected that have sufficient output current to fully supply the power requirements of the sensor module.

The output of analog to digital converter **25** sends a multiplexed digital data stream to a low-power microcontroller **24.** This device performs data value measurements, range checking, and executes the logic that determine whether alarm, tamper, or "all clear" messages should be transmitted via radio link **27** and antenna **28**. Status messages are transmitted occasionally at intervals of five to ten seconds for example. The transmission

interval is randomized to some extent so that messages from multiple sensor modules do not persistently collide and interfere with each other.

Figure 7 illustrates the logic implemented in the microcontroller. First, the digitized value from the ultraviolet sensor is compared with a threshold value to determine whether ultraviolet radiation is present. If so, a ten second timer is set and a bit in the status code word is set to indicate flame detection. As long as the timer value is greater than zero, this bit will remain set. Next, the digitized value of the photocell voltage is compared with a threshold to determine if visible light is present. If the light intensity is below the threshold, we surmise that someone has blocked the sensor to disable it. A ten second timer is then set and a bit is set in the status code word is set to indicate tampering. This bit remains set as long as the timer value is greater than zero. Next, the digitized value of the motion sensor is compared to a threshold. If the motion intensity is greater than the threshold value, vibration is present that is likely due to tampering. A ten second timer is then set and a bit in the status code word to indicate tampering. This bit remains set as long as the timer value is greater than zero.

After constructing the status code word, a random time delay is generated. Once this time delay has expired, the transmitter is turned on. Next, a data synchronization pattern is transmitted. This pattern is used by the receiver to establish proper bit rate synchronization and word framing. An identification code is then transmitted to distinguish which sensor is transmitting among a potentially large number of sensors. Next, the status code word is transmitted to indicate flame detection and tampering. The transmitter is then turned off. After transmitting the data, all of the timers are decremented by one second. The process of sensor measurement and evaluation is then repeated.

Figure 8 is a block diagram of the monitor used to read signals from one or more sensor modules. Signals received from sensor modules by antenna **29** are processed by radio receiver **30** to extract a digital bit stream representing transmissions from the sensor modules. This bit stream is sent to a low power microcontroller **32** for analysis and

reporting. The status of all sensors and a history of sensor status is stored in the sensor status list memory **33**. The user of the monitor can access this memory to locate alarm and tampering events that occurred previously. Status indicator **34** and alarm indicator **35** display the most recent sensor data.

Figure 9 is a flow chart of the processes performed by the microcontroller in the monitor. The firmware initially loops waiting for a signal from the receiver. When a signal is detected, the monitor searches for and acquires the synchronization pattern to establish word boundaries. Next the identification code and status codes are read and stored in the status memory along with the time that they were received. The sensor status memory is then scanned to find the elapsed time from the last report for each sensor. If several reports have been missed from a particular sensor, it is considered overdue, presumably due to tampering. The tamper alarm is then reported to the user. The current report is then checked for alarm conditions. If the alert code is present the flame alarm is reported to the user. If the tamper code is present the tamper alarm is reported to the user. The monitor then reverts to the search loop to wait for the next signal.

While a typical illustrative embodiment of the invention has been shown and described, numerous variations and alternate embodiments will occur to those skilled in the art. Such variations and alternate embodiments are contemplated, and can be made without departing from the spirit and scope of the invention as defined in the appended claims.

Claims: We claim:

1. An apparatus that innovatively combines a method to monitor a room for the occurrence of a flame while said apparatus does not respond to ordinary light as may be expected to ordinarily occur in said room and while said apparatus innovatively combines methods and sensors for the purpose of countering any of several deliberate means that may be expected to be caused by a person in an attempt to prevent the observation of said flame.

2. An apparatus of claim 1 that is positioned to continuously observe a volume such as a room and is mounted on the wall or ceiling or is otherwise positioned to provide a general view of the volume.

3. An apparatus of claim 1 that may have the appearance of an object appropriate for some other purpose to the volume, such appearance for the express purpose of camouflaging the intended purpose of the apparatus.

4. An apparatus of claim 1 that employs a detector of ultraviolet energy that may be generated by a flame from a candle, a match, a lighter, or other source of flame.

5. An apparatus of claim 1 that employs a detector of claim 4 that is not sensitive to electromagnetic radiation generated by lighting such as by standard incandescent or fluorescent lighting or by normal sunlight as may be normally expected to occur in said room.

6. A method of supplying electric power to an apparatus via long lasting, chargeable batteries, said method also preventing a person from blinding the flame detector.

7. A method of claim 6 that incorporates a photoelectric cell or solar cell that detects visible light.

8. A method of claim 6 utilizing the device of claim 7 in such a manner as to provide an alerting signal if the visible light is blocked such as may result from deliberate attempts to cover or otherwise blind the apparatus.

9. A method of claim 6 of utilizing the device of claim 7 in such a manner as to charge a battery and thus extend the life of said battery.

10. A method that generates an alerting signal if the apparatus is damaged such as may occur from deliberate attempts to prevent said apparatus from properly functioning.

11. A method that generates an alerting signal if the room apparatus is moved such as may occur from deliberate attempts to prevent said apparatus from properly functioning.

12. An apparatus that is generally resistant to shock such as may occur from deliberate attempts to prevent said apparatus from properly functioning.

13. An apparatus that contains a means to generate a signal that indicates a low battery level such as may degrade the proper performance of said apparatus.

14. An apparatus that contains one of several means of communicating an event to a person or persons that are local and or remote to said apparatus. Said alert may be local or remote and such means may be via wireless communication or via a wired communication.

15. An apparatus that communicates with a portable or fixed receiver for the purpose of notifying a person or persons of the occurrence of an event at the apparatus.

16. Said receiver of claim 15 having the means to communicate an alert to a person or persons via an audible and or a visible means of any of several events as may be detected by the apparatus.

17. An apparatus that generates an audible means of notifying a person or persons of an event such as by a buzzer, horn, siren, or other sound.

18. An apparatus that generates a visible means of notifying a person or persons of an event such as by a flashing light, a steady light, a strobe light, or an alphanumeric display.

19. An apparatus that generates a means of notifying a person or persons of an event such as by a pager, radio, or portable or wired telephone communications.

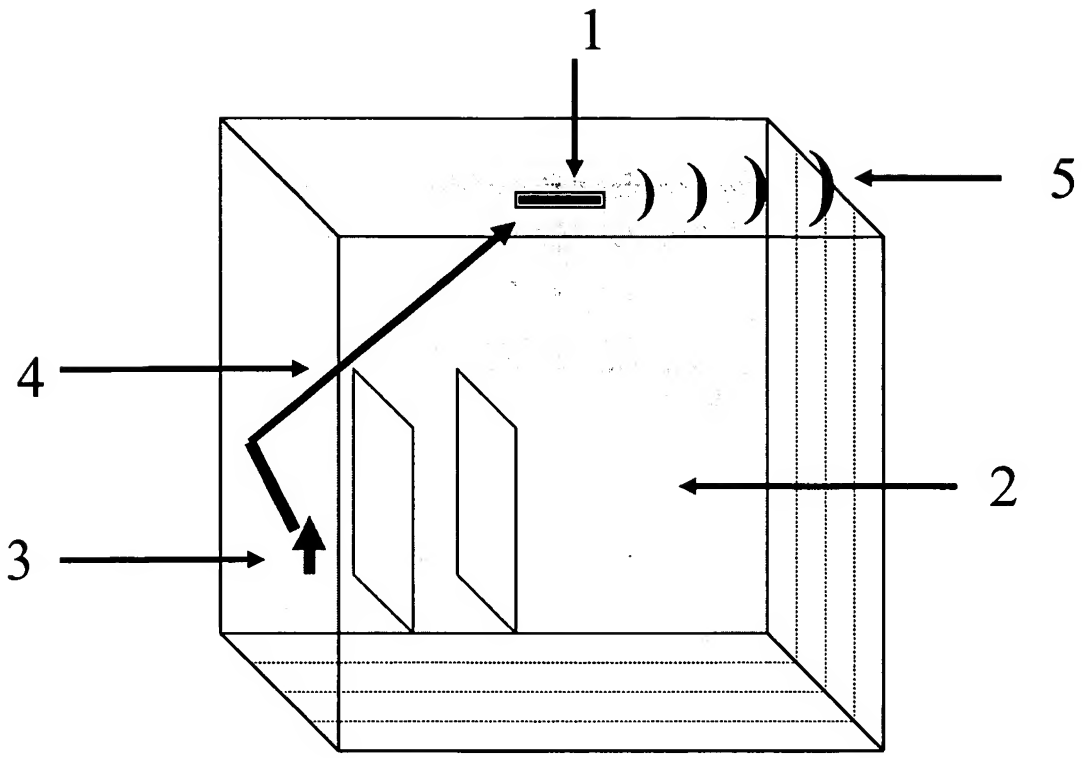
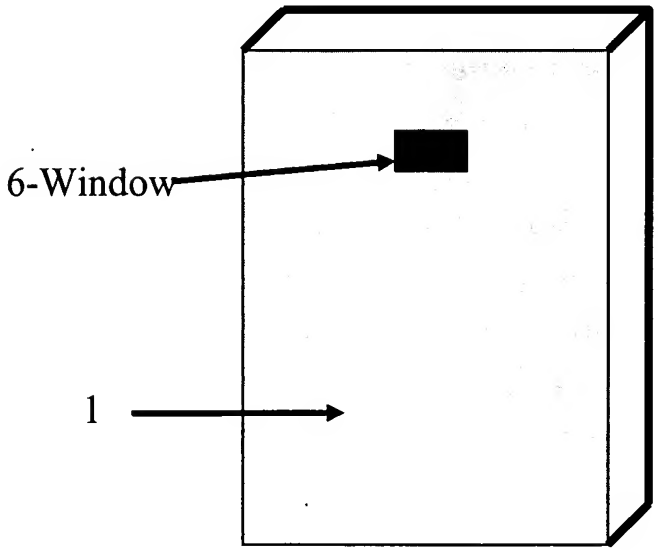


Figure 1: Typical Restroom Installation



12-Potted Circuitry
Hard Mounted to Wall

Figure 2: Sensor Module

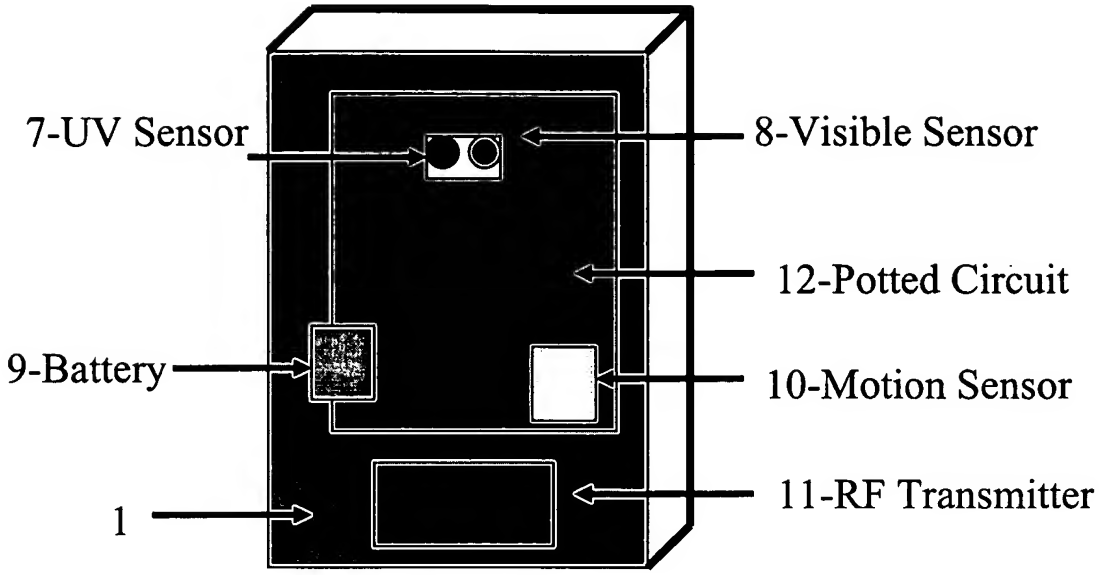
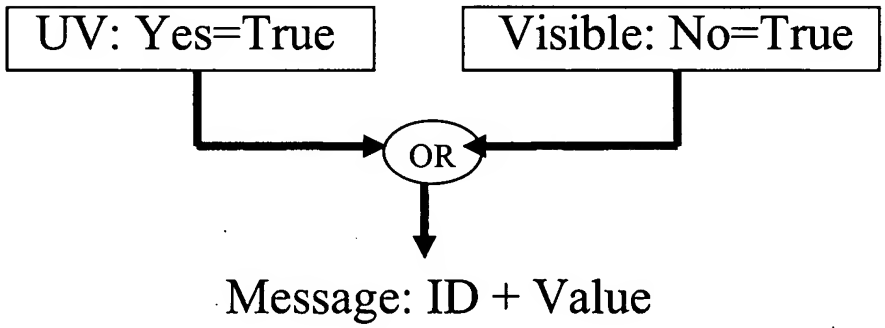


Figure 3: Module Sensors and Layout



Note: 'No Message' indicates damage or low battery.

Value = True indicates 'Alert' state.
Value = False indicates 'No Alert' state

Figure 4: Sensor Module Functions

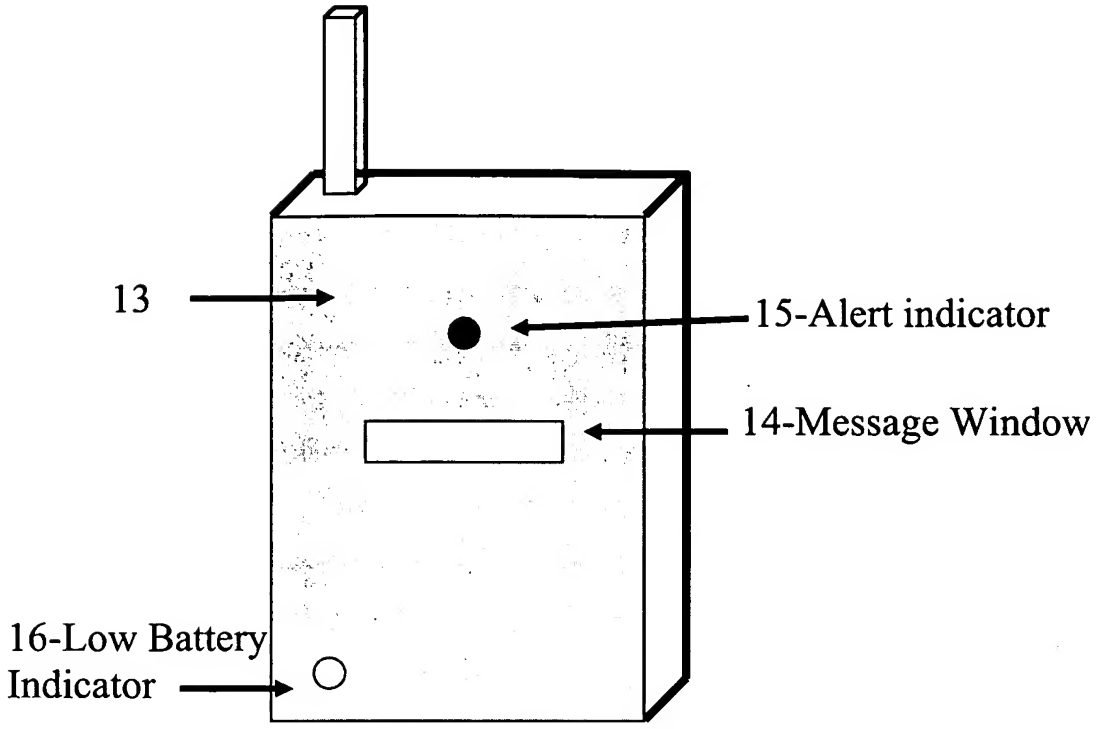


Figure 5: Monitor

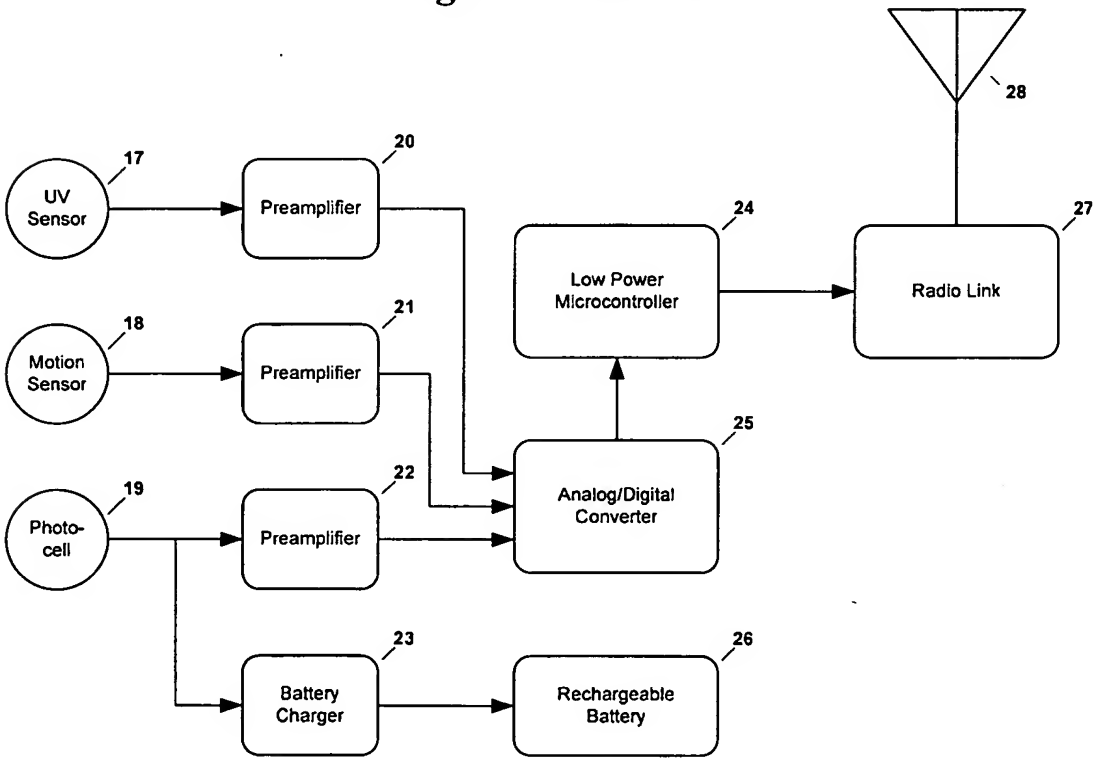


Figure 6: Sensor Module Block Diagram

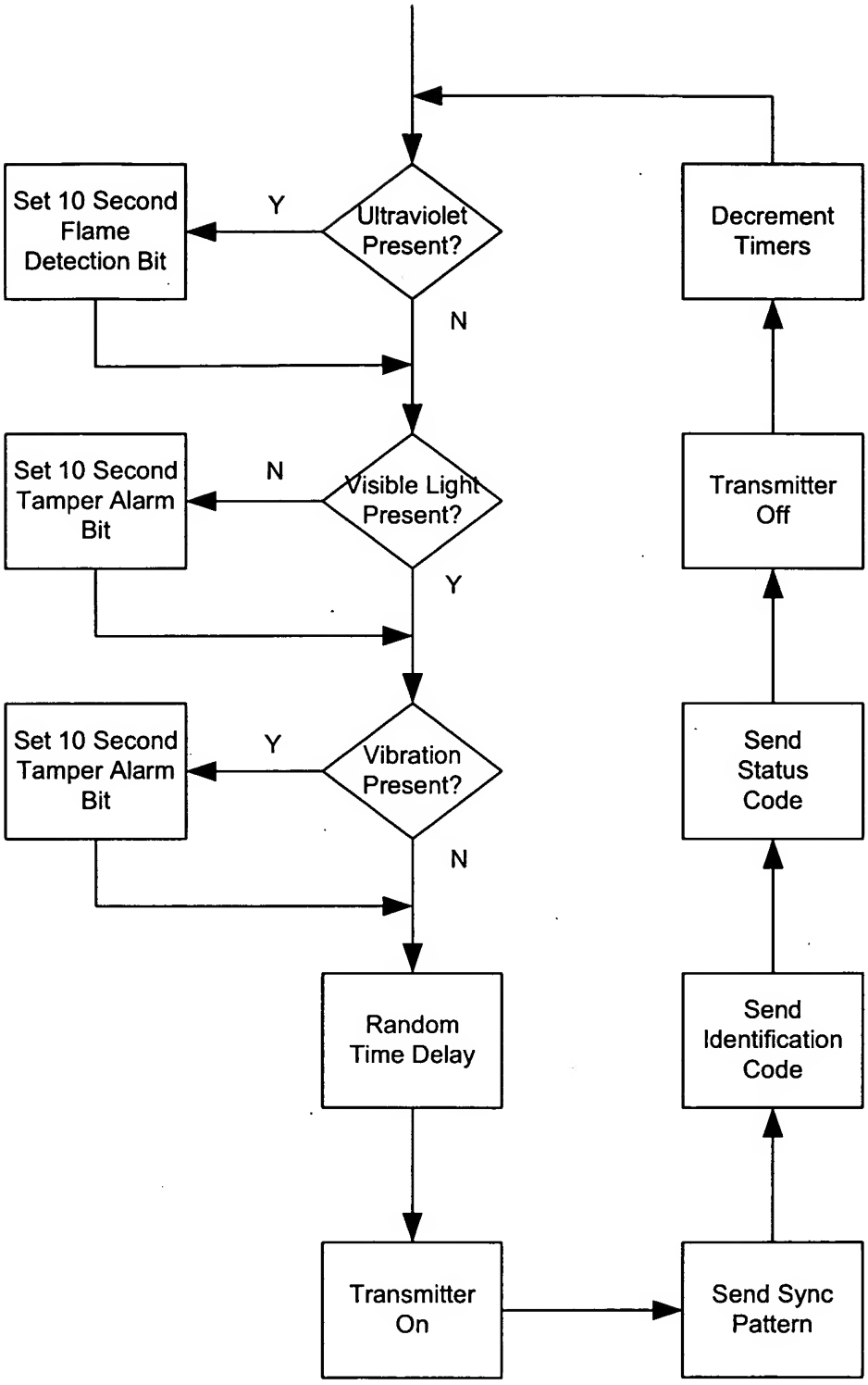


Figure 7: Sensor Operation Flow Chart

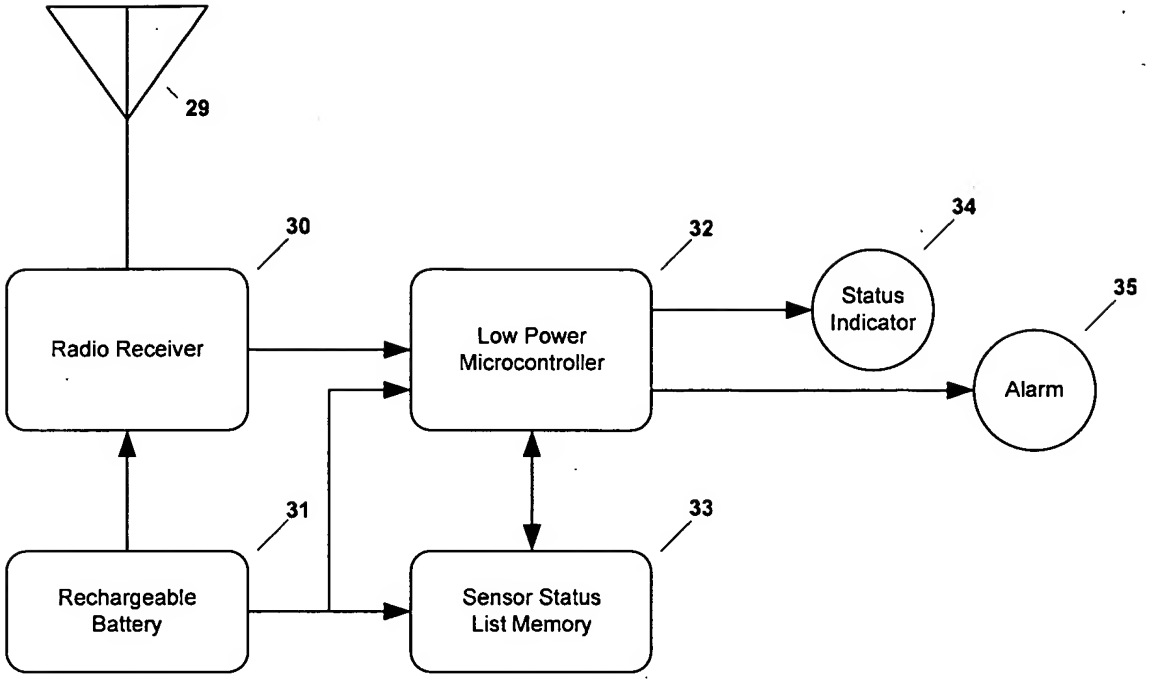


Figure 8: Monitor Block Diagram

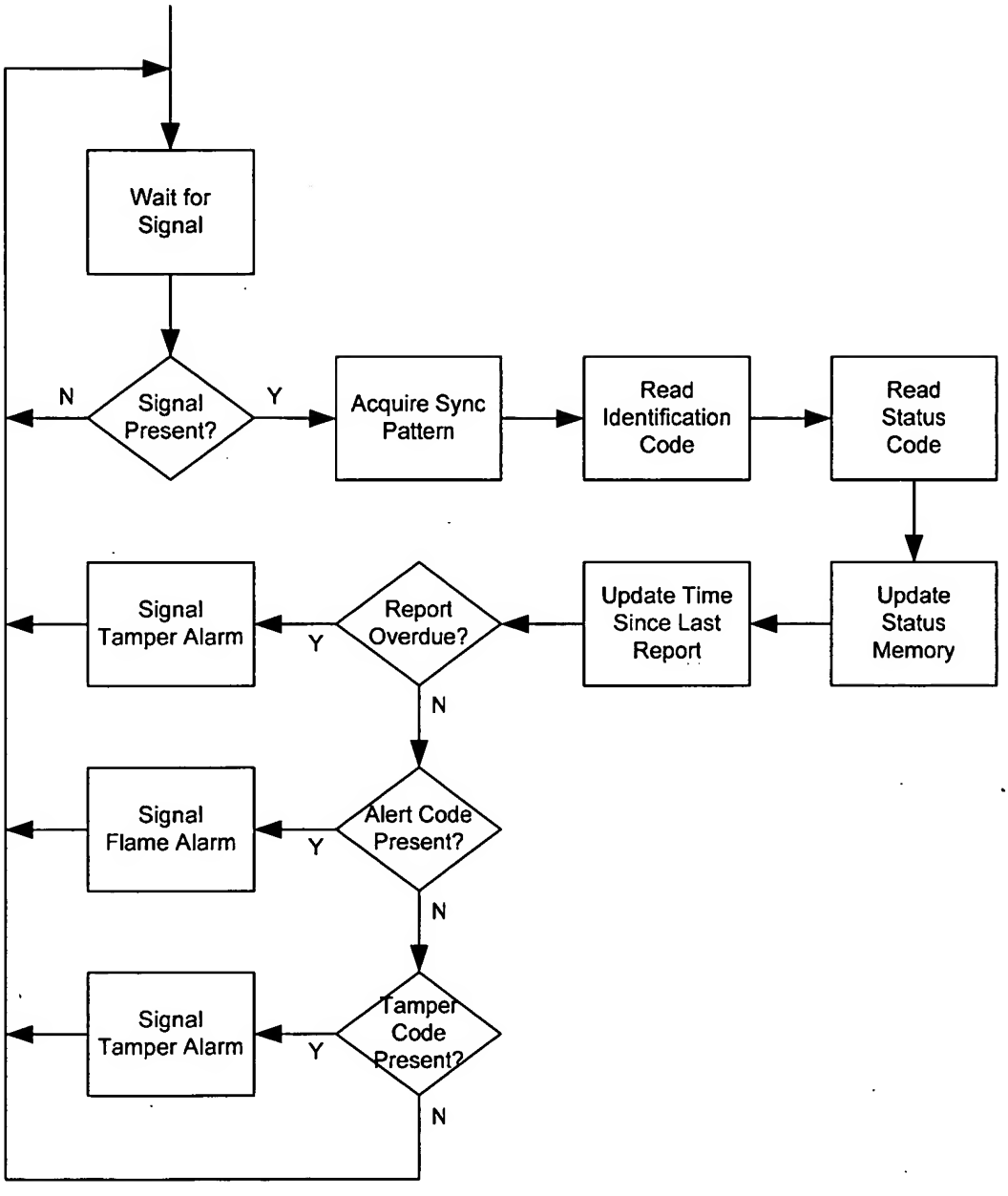


Figure 9: Monitor Functional Flowchart